

### **Remarks/Arguments**

Claims 46, 49, and 51 – 64 are pending. Claims 46, 49, 51 – 56, 61, 63, and 64 are rejected. Claims 57 – 60 and 62 are objected to but may be allowed if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 61 has been amended herein to correct minor typographical errors. No new matter has been entered in making the amendment nor is the amendment intended to narrow the claim in any way. Applicants' respectfully request that the Examiner enter the proposed amendments to the claim.

#### *I. The Prior Art Rejections:*

Claim 55 stands rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by, or in the alternative allegedly rendered obvious under 35 U.S.C. § 103(a), by U.S. Pat. No. 6,413,864 ("Pyo"). Applicants respectfully disagree. For a prior art reference to be anticipatory, MPEP § 2131 provides that: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628 (Fed. Cir. 1987). Further, the reference has to describe each and every element recited in the claim in as complete detail as is contained in the claim and arranged as recited in the claim. ("The identical invention must be shown in as complete detail as contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226 (Fed. Cir. 1989)).

Applicants respectfully traverse the §102(a) or 103(a) rejections of the claims by Pyo because Pyo does not disclose every limitation required in the claims nor describe every limitation in as complete detail and arranged as recited in the claims. While Pyo describes a tungsten nitride barrier layer 15 and one or more copper layers 18 and 19 that are deposited by a CVD method, Pyo fails to teach, *inter alia*, tungsten nitride barrier layers that are comprised of an orientation "selected from a non-stoichiometric surface comprising a lesser amount of nitrogen atoms than tungsten atoms contained therein, an amorphous surface, a polycrystalline surface, a stoichiometric surface having a preferred orientation other than a (100) orientation, a stoichiometric surface having a preferred orientation other than a (111) preferred orientation, and combinations thereof"; "exposing the surface of the diffusion barrier layer to an at least one adhesion promoting agent comprising nitrogen"; and "forming a metal film...on the at least one surface" of the diffusion barrier layer and as required in Applicants' claim 55. The method taught in Pyo tries to prevent the generation of voids or seams in a

subsequently deposited copper layer by using a chemical enhancer such as an iodine (I) catalyst (Pyo at col. 1, lines 43-57 and col. 2, lines 3-18). Pyo describes a diffusion barrier layer 15 which has a 5 to 500 Å thick seed layer (16) containing titanium (Ti), aluminum (Al) or copper formed thereupon (see *id.* at col. 2, lines 55 – 67 and col. 3, lines 1-2 and Fig. 1B). Referring to Fig. 1C, a chemical enhancement layer is then formed by conducting a chemical enhancer treatment that involves contacting the substrate with an iodine-containing liquid compound (see *id.* at col. 3, lines 3-35 and Fig. 1C and 1D). The first copper layer 18 is then deposited upon the chemical enhancer layer 17 (see *id.* at col. 3, lines 36-41, claim 1 and Fig. 1E) rather than directly **on** the surface of the diffusion barrier layer as required in Applicants' claim. Pyo does teach an annealing process wherein the substrate is exposed to a hydrogen reduction atmosphere which may include nitrogen. However, this annealing process is conducted **after** the first and second copper layers 18 and 19 are formed (see *id.* at col. 3, lines 65-67 through col. 4, lines 1-5) rather than "wherein at least a portion of the exposing step is conducted prior to the forming step" as required in Applicants' claim. Because Pyo fails to teach or suggest all of the required elements of claim 55, Pyo fails to neither anticipate nor render obvious Applicants' claimed invention. Applicants respectfully request that the prior art rejections of the claims by Pyo be removed.

Claims 46, 49, 51 – 54, 56, 61, and 63 – 64 are rejected on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over U.S. Pat. No. 7,311,946 ("Garg"). The nonstatutory obviousness-type double patenting rejections of these claims has been overcome by the filing herewith of a Terminal Disclaimer. The filing of the Terminal Disclaimer is not to be construed as an admission, estoppel or acquiescence. See *Quad Environmental Technology v. Union Sanitary District*, 20 USPQ2d 1392 (Fed. Cir. 1991) and *Ortho Pharmaceuticals Corp. v. Smith*, 22 USPQ2d 1119 (Fed. Cir. 1992). Applicants respectfully request the removal of the nonstatutory obviousness-type double patenting rejections of these claims.

## *II. Conclusion:*

Applicants believe that the foregoing constitutes a complete and full response to the Action of record. Applicants respectfully submit that this application is now in condition for allowance. Accordingly, an indication of allowability and an early Notice of Allowance are respectfully requested.

The Commissioner is hereby authorized to charge the fee required and any additional fees that may be needed to Deposit Account No. 01-0493 in the name of Air Products and Chemicals, Inc.

Should the Examiner require any further information, the Examiner is invited to contact Applicants' undersigned Attorney at the telephone number listed below.

Respectfully submitted,

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